ACTIVATED CARBONS AS CATALYTIC SUPPORT FOR Cu NANOPARTICLES

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Introduction

There are a wide range of catalytic applications for Cu-based nanoparticles materials, since Cu is an abundant and inexpensive metal and Cu nanoparticles possess unusual electrical, thermal and optical properties. The possible modification of the chemical and physical properties of these nanoparticles using different synthetic strategies and conditions and/or via postsynthetic chemical treatments has been largely responsible for the rapid growth of interest in these nanomaterials and their applications in catalysis. A previous work have explored the possibilities of SBA-15 (1,2) as support for Cu nanoparticles. In the present contribution, those results will be compared with the use of a carbon material as support, since activated carbon present many advantages with respect SBA, as the high surface area.

Materials and Methods

Two series of carbons activated from olive bone have been prepared by physical activation with CO_2 (AC) and chemical phosphoric acid (ACP). In addition, an activated carbon (PMC) was obtained using Zr-SBA-15 (PMS) as a template. The preparation of the PMC is carried out by impregnating the Zr-SBA-15 base with 1.4 ml of furfuril alcohol and finally eliminating the Zr-SBA-15 with HF and washing with Ethanol and Water.

Results and Discussion

The XRD study of this support showed the reflections (100, 110, 200) typical of the p6mm symmetry of this structure. Through the nitrogen adsorption-desorption isotherms, very different porous structures were observed with high SBET (1400-1700 m3 / g). The three carbons, in addition, were compared with the Zr-SBA-15 (SBA).

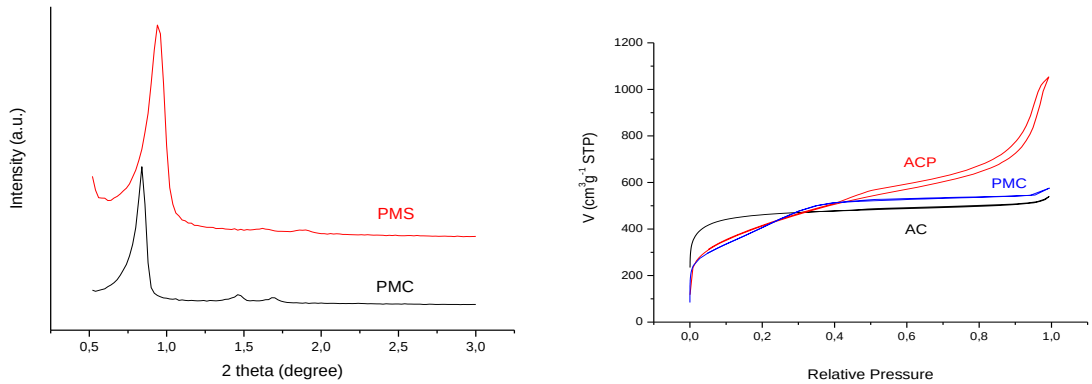

Figure 1. XRD patterns (A) and N_2 isotherms (B).

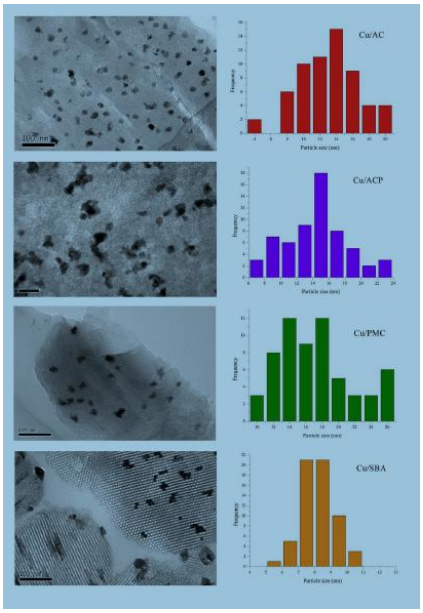

Figure 2. TEM analysis

Conclusions

The functionalization process of the supports was optimized in order to increase the number of oxygenated surface groups, treated at high temperature in order to eliminate unstable groups impregnated with Cu nitrate. Each support was treated with the same conditions of time, temperature, reagent concentration, Cu load, etc. The physical, chemical, structural and catalytic characterization of the catalysts thus prepared showed that these catalytic systems are very promising and that the carbonaceous supports prepared from biomass represent an economic alternative to other conventional catalytic supports.

Acknowledgment

MINECO CTQ2015-68654-R. F.J. Martín ackhowledges an Erasmus Mundus Action 2 Strand 2 (EMA2/S2 EursatiaCat) fellowship for his stay at National Tsing Hua University.

References

1. De C. H. Liu, N. C. Lai, J. F. Lee, C. S. Chen, and C. M. Yang, (2014). SBA-15-supported highly dispersed copper catalysts: Vacuum-thermal preparation and catalytic studies in propylene partial oxidation to acrolein. *J. Catal.* 316, 231-239.

2. C. Liu, N. Lai, S. Liou, M. Chu, C. Chen, and C. Yang (2013). Deposition and thermal transformation of metal oxides in mesoporous SBA-15 silica with hydrophobic mesopores. *Microporous Mesoporous Mater*. 179, 40-47.